



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/504,923	02/16/2000	Masamichi Harada	000155	6691

23850 7590 11/30/2001

ARMSTRONG, WESTERMAN, HATTORI,
MCLELAND & NAUGHTON, LLP
1725 K STREET, NW, SUITE 1000
WASHINGTON, DC 20006

EXAMINER

BEREZNY, NEAL

ART UNIT PAPER NUMBER

2823

DATE MAILED: 11/30/2001

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/504,923

Applicant(s)

Harada

Examiner

Neal Berezny

Art Unit

2823

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 03 October 2001.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-10 is/are pending in the application.
- 4a) Of the above claim(s) 9 and 10 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-8 is/are rejected.
- 7) ☒ Claim(s) 3 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 4.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

DETAILED ACTION

Election/Restrictions

1. Examiner acknowledges applicant's election of Group 1, claims 1-8, without traverse. Claims 9-10 are withdrawn from consideration as being directed to a non-elected invention and need to be canceled.

Information Disclosure Statement

2. The information disclosure statement filed 7/24/00 fails to comply with 37 CFR 1.98(a)(3) because it does not include a concise explanation of the relevance, as it is presently understood by the individual designated in 37 CFR 1.56(c) most knowledgeable about the content of the information, of each patent listed that is not in the English language. It has been placed in the application file, but the information referred to therein has not been considered. Specifically, German Patent DE 3522427 is cited in the IDS, without a sufficient statement of relevance, and lacks an English translation of any part. Examiner is also invoking 37 CFR 1.105 to request that applicant submit any English language translation applicant may have regarding the above cited German patent.

Claim Objections

3. Claim 3 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. Claim 3 depends on claim 2, which contains the limitation that the auxiliary gas is used in combination with the

Art Unit: 2823

feedstock gas, but claim 3 introduces the limitation that the feedstock gas is introduced without the auxiliary gas. These limitations are mutually exclusive and therefore claim 3 cannot further limit claim 2.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claims 1-7 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. In claim 1, feedstock gas is defined to be the combination of the metal containing gas and the nitrogen containing gas, but claims 4 and 5 suggest that the feedstock gas is the metal containing gas only. Further, claim 6 can be interpreted either way.

Claim Rejections - 35 USC § 102

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

7. Claims 1-5 and 8 are rejected under 35 U.S.C. 102(b) as being clearly anticipated by Lu (EP 0 840 363 A1). Lu places a substrate in a vacuum, fig.1, el.101, introduces a feedstock gas having a metal gas and a reductive nitrogen gas, el.103, forming a metal nitride layer, col.3, ln.13-20, introducing an auxiliary reactive gas, col.3 ln.23, and 55, with the feed gas, col.3, ln.1-5, and without the feed gas, col.3, ln.52,

Art Unit: 2823

wherein the flow rate of nitrogen gas is greater than that of the metal gas, col.4, ln.29-30, and the flow of the auxiliary gas is greater than, but less than 10 times the flow nitrogen gas, col.4, ln.30-31, and an auxiliary flow greater than but less than 15 times the metal gas flow, col.6, ln.22-24. Further, Lu also teaches treating the exposed surface of the substrate with hydrogen plasma and a plasma selected from argon, nitrogen, and helium gases, el.102.

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

9. Claims 6-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lu as applied to claims 1-5 and 8 above, and further in view of Akahori (EP 0 536 664 A1). Lu teaches nitrogen gas flows higher than those claimed by applicant, col.3, ln.20-29. Further, Lu does not teach the use of a diluent gas containing oxygen and at pressures lower than applicant, col.3, ln.20-29. Akahori teaches the use of a plasma ashing containing oxygen plasma while forming a metal nitride layer, p.7, ln.53-55. It would be obvious to one of ordinary skill in the art at the time of the invention to combine Akahori with Lu to include an ashing plasma containing a diluent gas containing oxygen, in order to clean and remove organic residues on the surface of the wafer than can contaminate the metal nitride layer increasing resistivity and the probability of defects.

Art Unit: 2823

10. Akahori also teaches using pressures lower than that claimed by applicant, p.7, ln.53-55. It would be obvious to select a pressure range between the teachings of Lu and Akahori in order to obtain material properties between Lu and Akahori, such as faster throughput than in the high vacuum system and better step coverage than the low vacuum system.

11. Lu also teaches that the nitrogen levels in the reaction affect the amount of nitrogen in the metal nitride. It would be obvious to lower the nitrogen flow rate to reduce the amount of nitrogen in the metal nitride in order to increase the conductivity of the metal nitride layer thereby increasing the speed of the device and reducing the device's power consumption.

CONCLUSION

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Neal Berezny whose telephone number is (703) 305-1481. The examiner can normally be reached on Monday to Friday from 9:00 to 5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy, can be reached at (703) 308-4918. The fax phone number for the organization where this application or proceeding is assigned is (703) 308-7724.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

Neal Berezny 11-19-01

Neal Berezny

Patent Examiner Art Unit 2823

George Fourson
Primary Examiner

George Fourson
George Fourson
Primary Examiner

2823